

Vertical Transformations

New function	How points in graph of $f(x)$ become points of new graph	visual effect
$f(x) + d$	$(a, b) \mapsto (a, b + d)$	shift up by d
$f(x) - d$	$(a, b) \mapsto (a, b - d)$	shift down by d
$cf(x)$	$(a, b) \mapsto (a, cb)$	stretch vertically by c
$\frac{1}{c}f(x)$	$(a, b) \mapsto (a, \frac{1}{c}b)$	shrink vertically by $\frac{1}{c}$
$-f(x)$	$(a, b) \mapsto (a, -b)$	flip over the x -axis

Horizontal Transformations

New function	How points in graph of $f(x)$ become points of new graph	visual effect
$f(x + d)$	$(a, b) \mapsto (a - d, b)$	shift left by d
$f(x - d)$	$(a, b) \mapsto (a + d, b)$	shift right by d
$f(cx)$	$(a, b) \mapsto (\frac{1}{c}a, b)$	shrink horizontally by $\frac{1}{c}$
$f(\frac{1}{c}x)$	$(a, b) \mapsto (ca, b)$	stretch horizontally by c
$f(-x)$	$(a, b) \mapsto (-a, b)$	flip over the y -axis